CONCEALED PIPING INTEGRITY ASSESSMENT WITHIN UKRAINIAN NPPS LTO JUSTIFICATION

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According to “European Nuclear Safety Regulator's Group ENSREG .1st Topical Peer Review Report «Ageing Management». October 2018” (Ageing Management Programme) AMP on concealed pipework have not yet proven to be effective, as they have only recently been introduced. With respect to LTO two problems arise for effective ageing management. The first one is linked with buried or underground location of concealed piping and general inaccessibility for inspection using conventional techniques as result. So, the decision about future safe operation must be justified based on inspection in accessible locations and indirect non-destructive testing. The second issue relates to strength assessment of multibranch concealed piping as methods and requirements for calculation of buried and underground piping are not well-developed and verified in comparison with appropriate techniques for main equipment of NPP. The main aim of the work is to present recent experience regarding concealed piping LTO justification for Ukrainian NPPs. The paper includes overview of applied non-destructive techniques as well as numerical modelling of concealed piping for different types of strength assessment. Considering seismic analysis two types of loading are taking into account: permanent ground-induced load due to earthquakes and common oscillation. Due to the absence of a strict methodology on how to obtain the correct value of permanent ground displacement after seismic influence, depending on its magnitude the seismic accelerograms as input data were used. Stress state under permanent ground-induced load is calculated by non-linear numerical solution for pipe-soil interaction. For conventional oscillation under seismic influence the effective numerical model based on linear spectrum method is proposed in the paper. In the conclusion potential gaps for LTO justification and recommendations for AMP of concealed piping have been formulated.

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